woellner

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Austria

# Geosil – ready to use alkali silicates for Geopolymers


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# Content

# 1 Introduction

- Owned by Dr. Eduard Wöllner family foundation
- 120 years of experience (founded in 1896)
- Head Office in Ludwigshafen / Germany
- Main product groups:
  - industrial silicates
  - raw materials and additives for paints, plasters and construction materials
  - process chemicals for industrial water circuits
- Approx. 140 employees
- Annual turnover approx. 50 million Euros

# Production Sites

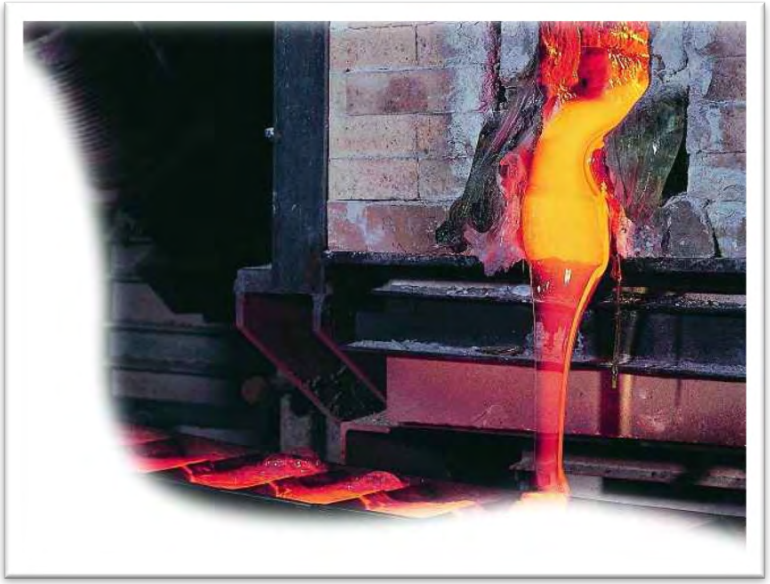

**Ludwigshafen:**
**headquarter and production site**

**Bad Köstritz:**
**production site**

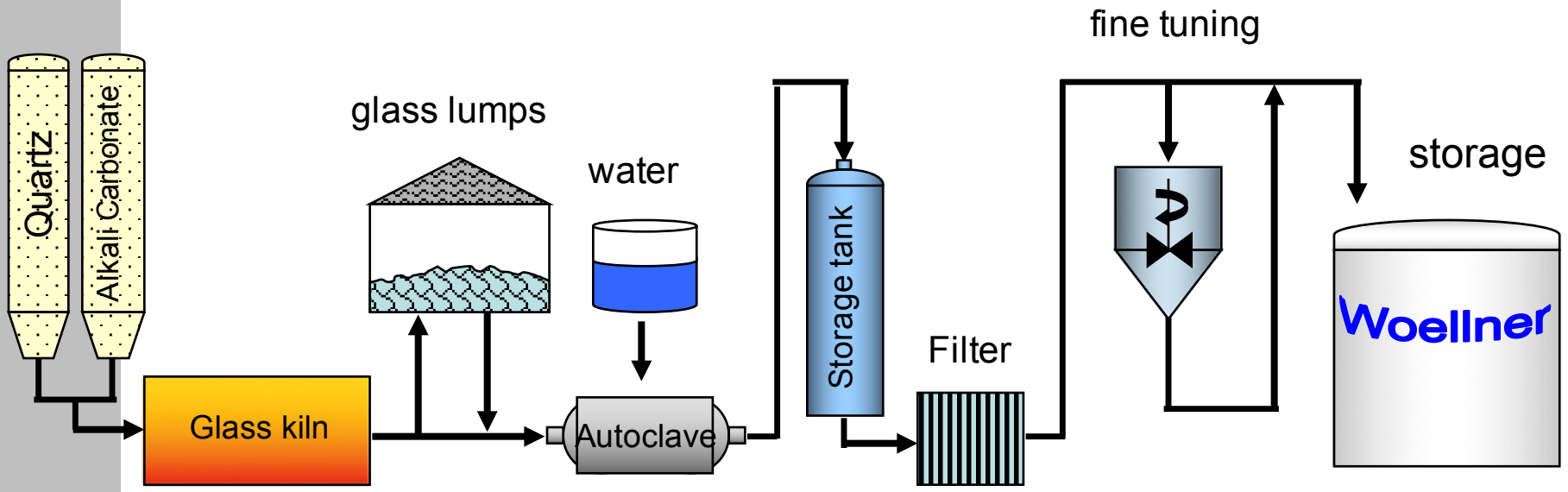
**Gratwein-Straßengel:**
**sales department and production site**

# Waterglass

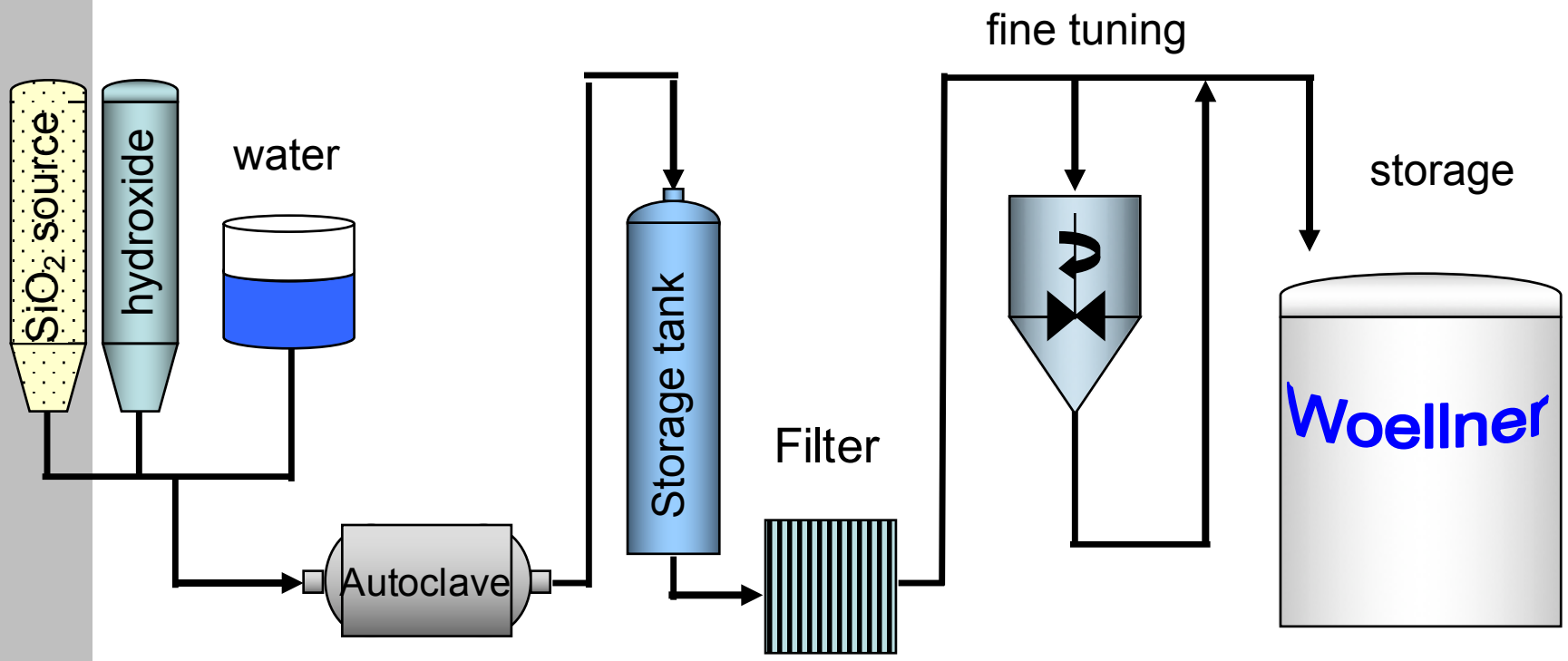
- not distinct stoichiometric chemical substances
- no specific chemical formula
- glasses or aqueous solutions of glasses



# Melting/Solving Process




# Hydrothermal process




$$2\ MOH + x\ SiO_2 \longrightarrow M_2O \bullet x\ SiO_2 + H_2O$$

M = Na, K, Li

# Definition molar ratio

*weight ratio:*

$$WR = \frac{\text{wt.\% } SiO_2}{\text{wt.\% } M_2O}$$

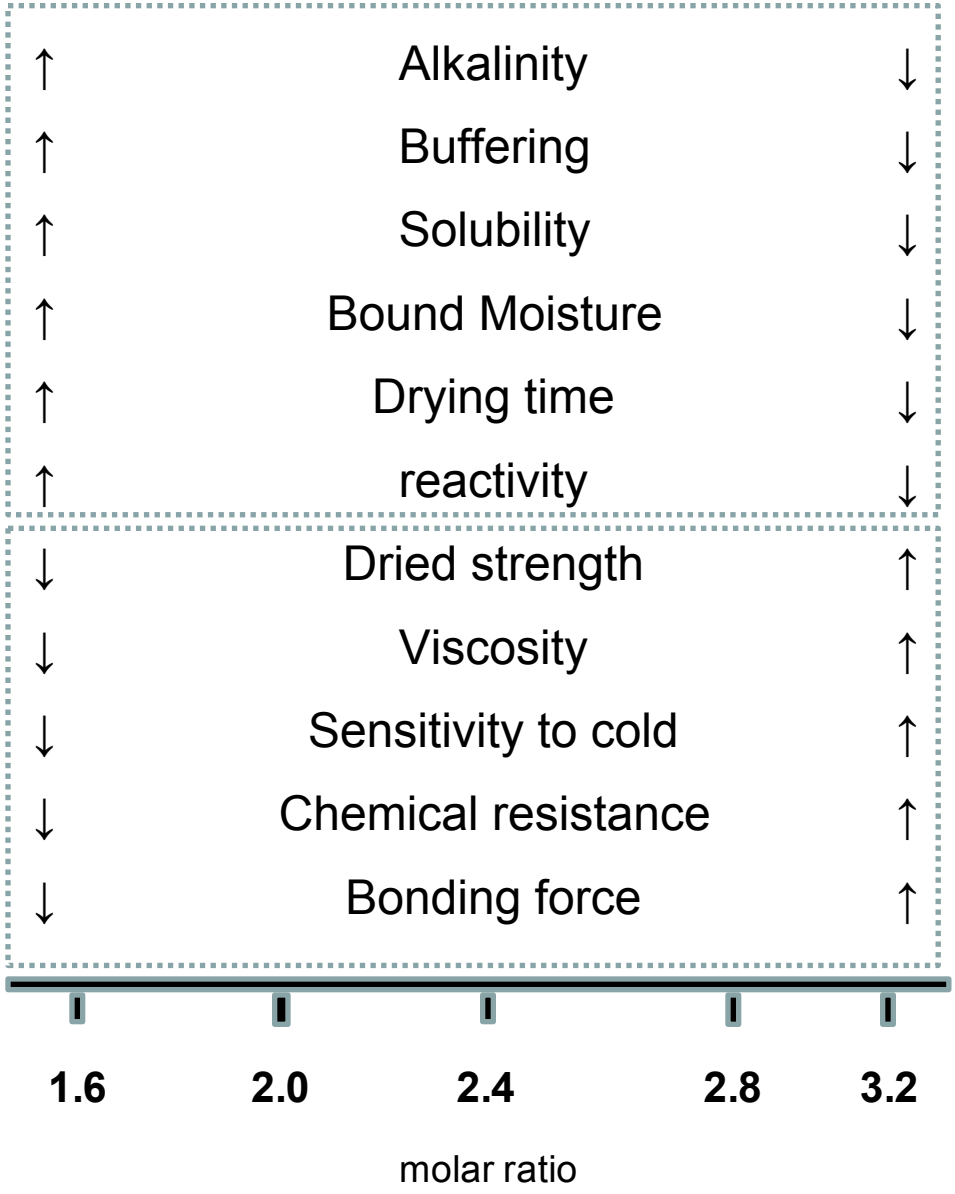
*molar ratio:*

$$MR = \frac{\text{mol } SiO_2}{\text{mol } M_2O}$$

**Molar Ratio ⇔ Weight Ratio**

sodium silicate: Molar Ratio = 1,032 • Weight Ratio
potassium silicate: Molar Ratio = 1,566 • Weight Ratio

# Properties according molar ratio



# Basics of alkali silicates

**technical significant liquid silicates:**

| | |
|---|---|
| Sodium silicate: | molar ratio 1,7 – 4 |
| Potassium silicate: | molar ratio 0,5 – 4 |
| Lithium silicate: | molar ratio 2,5 – 5,0 |

**Suitable silicates for Geopolymer:**

| | |
|---|---|
| Sodium silicate: | molar ratio 1,7 – 2,0 |
| Potassium silicate: | molar ratio 1,5 – 2,3 |

# Classification (soluble silicate solutions)

| | Molar ratio $SiO_2 : M_2O$ | „Old“ Classification (Handling) | Dangerous Goods Classification (Transport) | CLP-Classification |
|---|---|---|---|---|
| — | **> 3,2** (conc. < 40 %) | none | none | none |
|  | **> 3,2** (conc. > 40 %) | Xi irritant R 36/38 | none | Warning<br>Skin Irrit. 2 H315<br>Eye Irrit. 2 H319 |
|  | **> 2,6 ≤ 3,2** | Xi irritant R36/38 | none | Warning<br>Skin Irrit. 2 H315<br>Eye Irrit. 2 H319 |
|  | **> 1,6 ≤ 2,6** | Xi irritant R38, 41 | none | Danger<br>Skin Irrit. 2 H315<br>Eye Dam. 1 H318 |
|  | **≤ 1,6** | C corrosive R34 | Cl. 8 / VGr. II | Danger<br>Skin corr. 1B<br>Eye Dam. 1 H314<br>Met. corr. 1 H290 |

# GEOSIL® Products

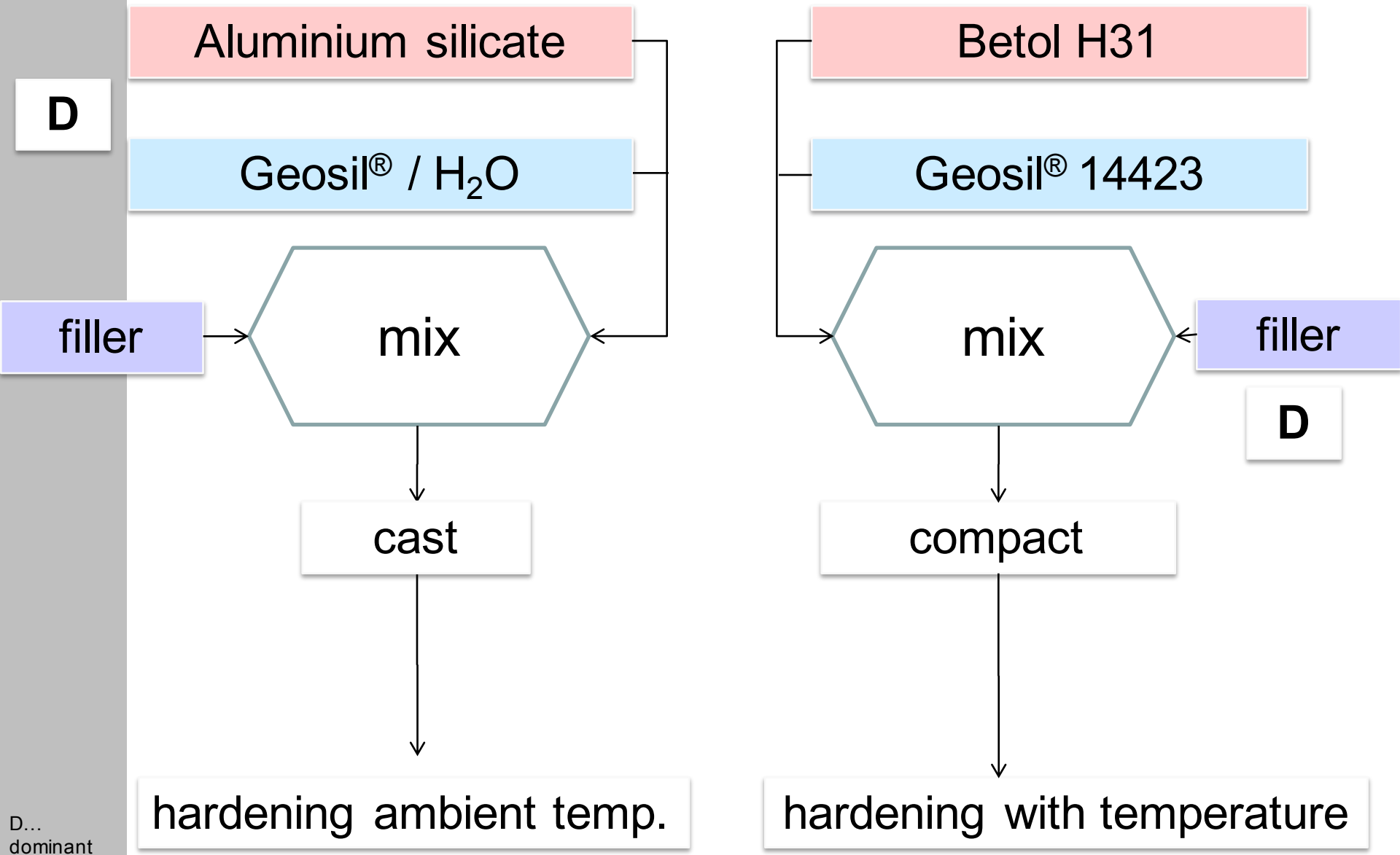
| | Name | Type |
|---|---|---|
| 1 | Geosil 34417 | Sodium silicate |
| 2 | Geosil 54217 | Sodium / potassium mixed silicate |
| 3 | Geosil 14515 | Potassium silicate |
| 4 | Geosil 15517 | Potassium silicate |
| 5 | Betol VP6079 | Alumosilicate based hardener |
| 6 | Betol H31 | Alumosilicate based hardener |
| 7 | Geosil 14423 | Potassium silicate |

# Why Geosil?

- ready formulated mixtures
- quality controlled process
- userfriedly - no hydroxide handling
- high purity of raw materials
- reproduceable & controlled production process
- stable solution
- worldwide shipping possible
- guarantee of chemical composition
- long shelf life

## Binder dominant

## filler dominant




D... dominant

# Application with Geosil® Binder

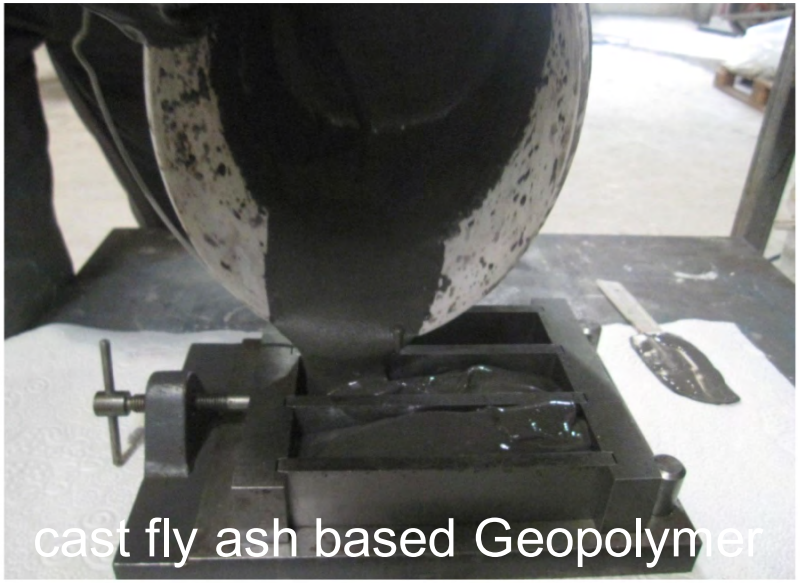
## Binder dominant

- geopolymer concrete
- geopolymer adhesive
- geopolymer mortar
- Inorganic foam
- toxic waste immobilisation
- composites
- steel coating

## Filler dominant

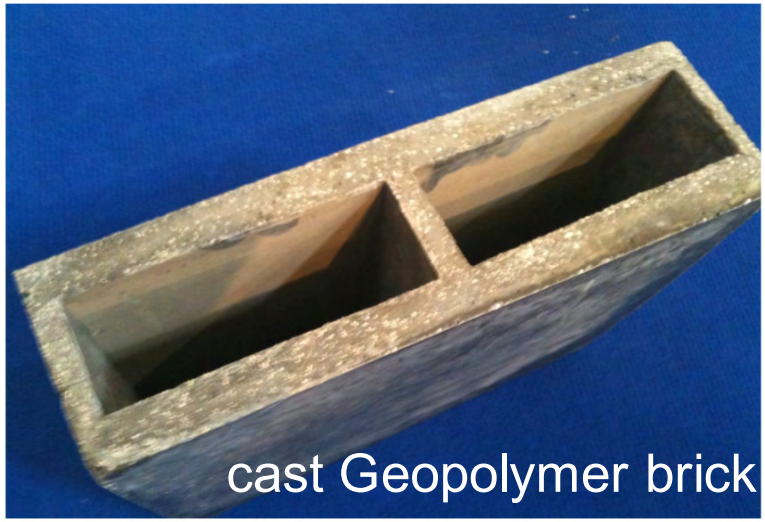
- acoustic boards
- thermal insulation boards
- fire protection boards
- refractory bricks
- pavement stone
- facade elements
- core binder foundry
- Arts & decoration

# Binder dominant


cast fly ash based Geopolymer


cast Geopolymer wash bowl


50Mpa compressive strength(28d)



cast Geopolymer brick

# Filler dominant

desert sand geopolymer bonded

GP lightweight epoxy composite

Geopolymer bonded MgO

lightweight insulation of clay bricks

# Summary: customer questions

- Which raw material to choose?
- Which alkali silicate to choose?
- Which aluminium silicate to choose?
- Which filler/other raw materials to choose?
- How to avoid crack formation?
- How to avoid shrinkage?
- How to control cure process?
- How to find the right mixture?
- How to develop 1K System?
- Which standard to use?
- How to understand chemical reactions?

# Summary: how Wöllner can support you

- „Geosil“ Binder - ready to use activator solution
- Hardener for Geosil Binder
- customized products (blends, modified products)
- Additives stable at high pH-values (thickener, dispersing-agent, hydrophobic agent)
- Worldwide logistic for all products
- Individual technical support for customers
- Worldwide network with international partners

# The partner by your side